Operator's Manual

APRICORN

Apricorn

8Ø Column Video Display/1K Version and 8Ø Column Video Display/64K Version

for the Apple][e Computer

Operator's Manual

Contents

Introduction

The Apricorn 80 Column Video Display is a plug-in circuit board for the Apple][e computer that provides the capacity to expand the standard 40 column display to a full 80 columns. The 64K Version provides 80 column display capability as well as 64K bytes of additional RAM (Random Access Memory). This extends the RAM capacity of your Apple][e from 64K to 128K. A unique feature of the 80 Column Video Display/1K Version is that it can be upgraded to the 64K Version with our 64K Upgrade Kit.

The 80 Column Video Display is fully compatible with the Apple 80 Column Text Card. This insures total compatibility with all present and future Apple software. It also works with all Apple operating systems including DOS 3.3, Applesoft and Integer BASIC, Apple Pascal and FORTRAN, Apple PILOT, Apple Logo, and all CP/M systems (Microsoft, ALS and PCPI).

The 80 Column Video Display can greatly enhance your Apple][e computer. Word processing now becomes easier as you can see on the screen exactly what will be printed. Financial spreadsheet programs can display twice as much information on the screen at one time. Applesoft and Integer BASIC users will find additional editing features useful for their program development. The 40 and 80 column video displays can easily be switched back and forth under keyboard or program control.

The 80 Column Video Display/64K Version adds even more power to your Apple][e computer. Software packages that take advantage of the extra memory will be able to do their job better and faster. A jumper is provided on the circuit board that allows display of double high resolution graphics. This allows a degree of pixel density equal to 192 X 560, double the standard density of 192 X 280.

The expandability of the 80 Column Video Display/1K Version to the 64K Version gives you flexibility. If you decide on the 1K Version and then find out you need the 64K Version, the money spent on the 1K Version won't be wasted.

We feel so strongly about the quality and reliability of the 80 Column Video Display that it is backed with a full **LIFETIME WARRANTY.** This means for as long as you own the product, if it fails, it will be repaired or replaced free of charge.

Installation

This section will provide step by step instructions for installing the 80 Column Video Display in your Apple][e computer. Please note that this product is designed specifically for the Apple][e computer with its auxiliary slot. It cannot be used with the Apple][or][+ computers. Please read this entire section before attempting installation to familiarize yourself with the overall procedure, then perform each step in order exactly as detailed. Installation should be simple if care and caution are used.

WARNING

Attempting to insert or remove any peripheral boards in your Apple][e computer while the power is on will result in damage to the peripheral boards and the Apple][e computer. Be sure to turn off the power to your Apple][e computer before performing any installation steps in this section.

Removing the Cover

1. Turn off the power to your Apple][e. The POWER light in the lower left corner of the keyboard should not be illuminated.

2. Remove the cover from your Apple][e by pulling up on the rear corners of the cover until a slight pop is heard. Pull up enough to separate the fasteners, then stop.

3. Slide the cover rearward away from the Apple][e. You should now be able to see the interior of your Apple][e. Check inside the Apple][e to be sure the red light in the back is NOT on. If it is, the power is still on and should be turned off.

Interior of the Apple][e Computer

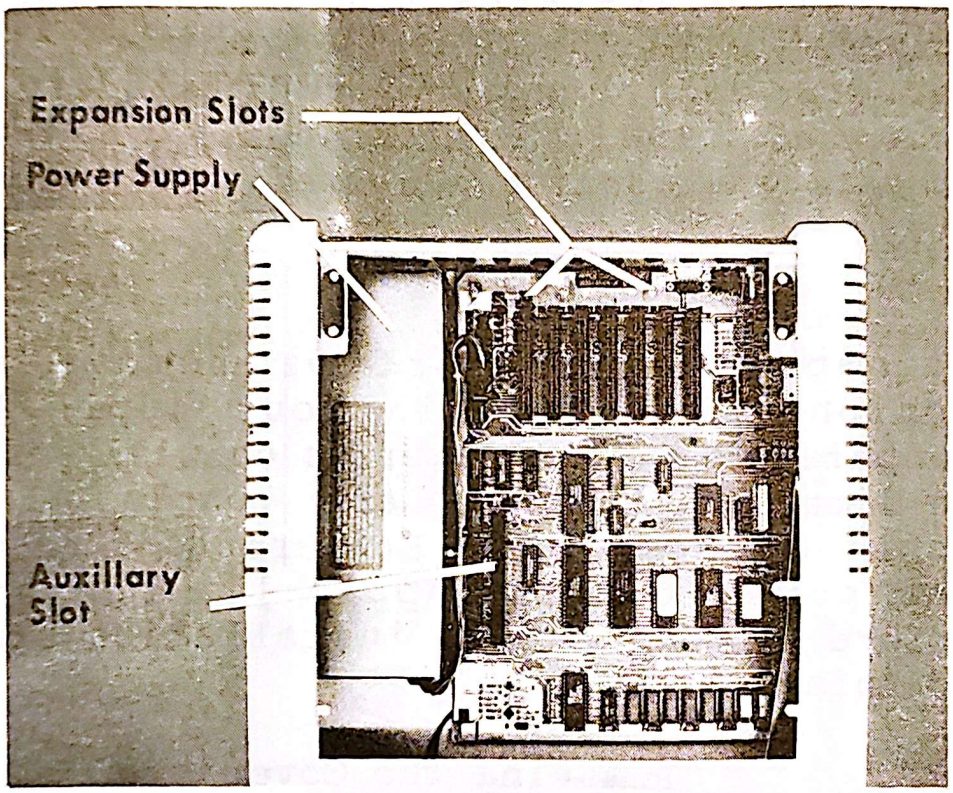

Figure 1

4. Position your Apple][e computer comfortably in front of you with the keyboard nearest to you. Familiarize yourself with the various interior components of the Apple][e computer. See Figure 1 for details. These will be referred to in later installation steps.

Inserting the 80 Column Video Display

The 80 Column Video Display plugs into the auxiliary slot on the Apple][e main logic board.

1. Find the auxiliary slot inside your Apple][e. This slot is actually labeled AUX. CONNECTOR and is located on the left side of the main logic board next to the power supply.

2. Touch the power supply cover to discharge yourself of any static electricity you may be carrying. This precaution prevents any damage that might be incurred to your 80 Column Video Display.

3. Familiarize yourself with the 80 Column Video Display circuit board. See Figure 2 for details. Take note of the various parts of the circuit board as they will be referred to in later installation steps.

The 8Ø Column Video Display

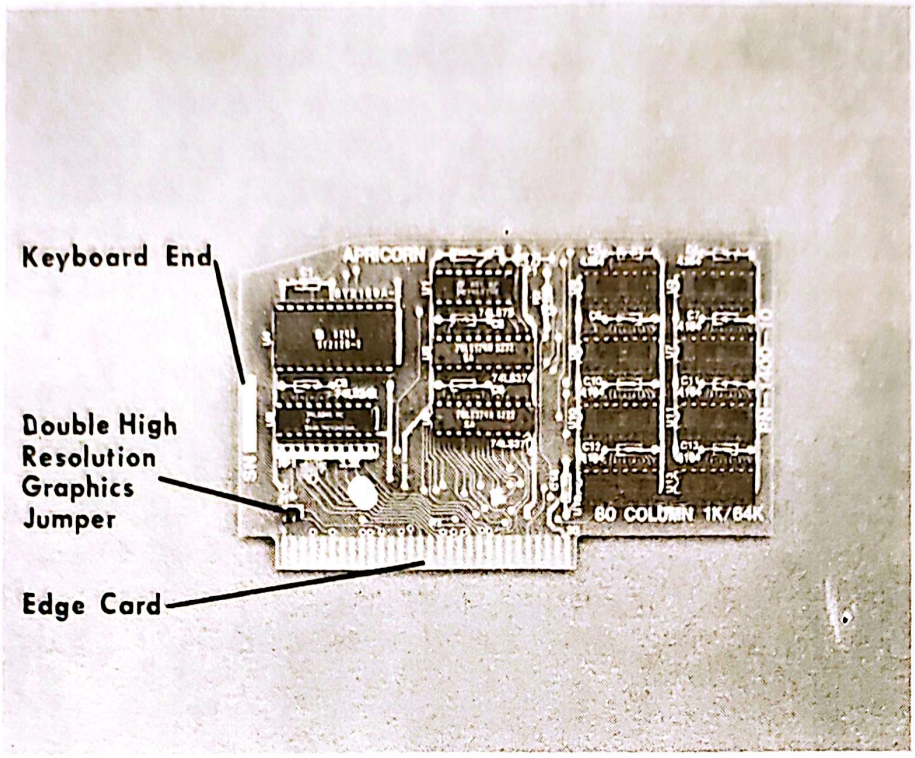

Figure 2

4. Position the 8Ø Column Video Display over the auxiliary slot. The edge marked KEYBOARD END should be pointing toward the keyboard. Also, the chips should be facing away from the power supply, just as they do on boards in the expansion slots.

5. Insert the 8Ø Column Video Display into the auxiliary slot. Press firmly with a slight rocking motion from front to back until the board is fully seated. See Figure 3 for an example of a correctly inserted 8Ø Column Video Display.

A Correctly Installed
8Ø Column Video Display

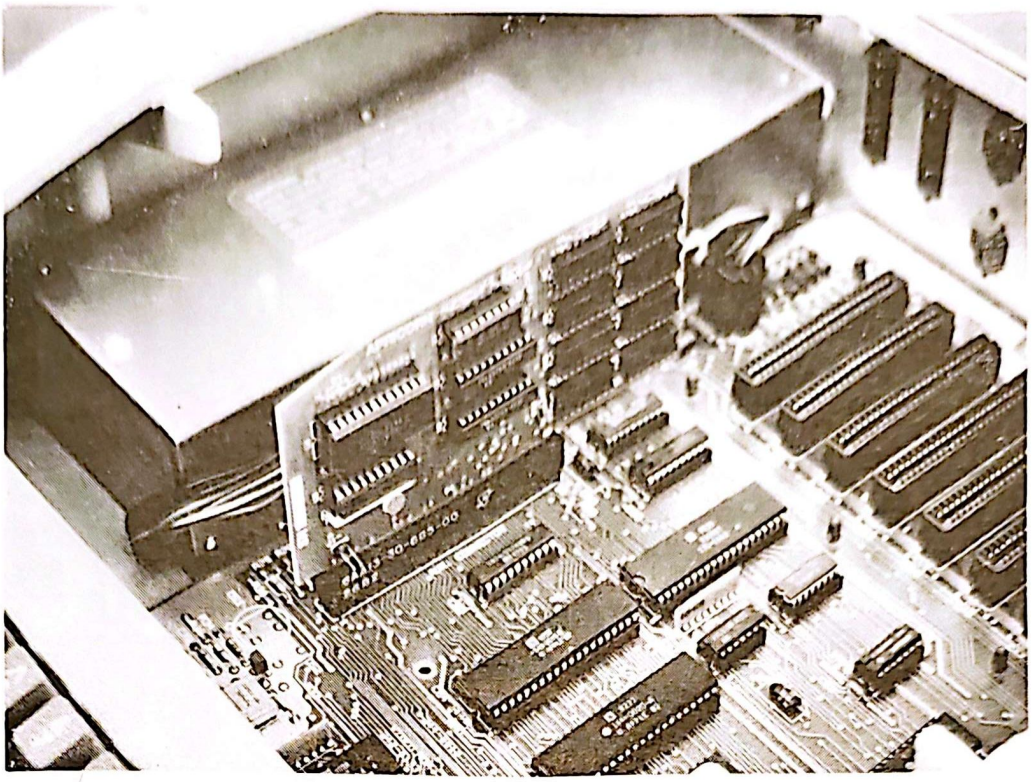

Figure 3

6. Remove any card that may be installed in expansion slot 3. In the Apple][and Apple][+ computers, slot 3 was conventionally used for 8Ø column boards. Although there is a slot 3 inside the Apple][e, installation of the 8Ø Column Video Display renders this slot inoperable.

7. Replace the cover on your Apple][e. Slide the cover from the rear toward the keyboard. After the cover is in place press down on the rear corners of the cover until the fasteners snap into place.

8. Recheck the installation of the 8Ø Column Video Display. You may want to reread the installation section.

The 8Ø Column Video Display is now installed and ready for use. Go on to the next section to learn how to use the 8Ø Column Video Display.

Using the 80 Column Video Display

The 80 Column Video Display is designed to behave like an 80 column board installed in expansion slot 3 of an Apple][or Apple][+. If you are familiar with the operation of an 80 column board in an Apple][, you can skip this section and go on to the next one.

If your use of the 80 Column Video Display is limited to the use of prepackaged software, you don't need to read the rest of this section. Refer to the manual that came with your software replacing all occurences of 80 Column Text Card with 80 Column Video Display.

This section will describe how to use the 80 Column Video Display under DOS 3.3 or BASIC, Apple Pascal and the CP/M operating system.

Use with DOS 3.3 or BASIC

When your Apple][e is first turned on the 40 column display is active. In order for the 80 Column Video Display to be used it must first be activated. After it is activated you can switch back and forth between 40 and 80 column displays. You can also deactivate the 80 Column Video Display. Here is a brief summary of the steps necessary to perform these functions.

1. Start up the Apple][e by putting a DOS 3.3 startup disk in drive 1 (if you have a disk drive) and turning the computer on.

2. Press the <CAPS LOCK> key for upper case only operation.

3. Type PR#3 <RETURN> to activate the 8Ø Column Video Display. The screen should clear after this command.

4. Press <ESC> and then the 4 key to temporarily switch back to a 4Ø column display.

5. Press <ESC> and then the 8 key to return to the 8Ø column display.

6. Press <ESC> and then <CTRL-Q> to deactivate the 8Ø Column Video Display.

Does PR#3 seem like an obscure command to activate the 8Ø Column Video Display? When you type PR#n (n being a number between 1 and 7), you activate an expansion slot inside your computer. 8Ø column boards for the original Apple][computer were designed to be installed in slot 3. The Apple][e treats the 8Ø Column Video Display installed in the auxiliary slot as if it were an 8Ø column board installed in slot 3. Therefore, all software written for the Apple][and Apple][+ computers will run properly on the Apple][e.

Using a Peripheral Device

In order to use another peripheral device such as a printer in slot 1 or starting up a disk controller in slot 6 the 8Ø Column Video Display must be deactivated first or an unpredictable and confusing display will result. A common scenario would occur as you are working on a BASIC program with the 8Ø Column Video Display active. After making a few changes you wish to produce a listing on the printer. Here is what you should do:

1. Deactivate the 8Ø Column Video Display by typing <ESC> <CTRL-Q>.

2. Activate the printer in slot 1 by typing PR#1. This switches all output to the printer instead of the video screen.

3. List the program on the printer by typing LIST.

4. Activate the 8Ø Column Video Display by typing PR#3. This returns output to the 8Ø column display.

8Ø Column Display at Start Up

When you start up your Apple][e computer it looks for a greeting program. This greeting program is designed to perform functions that you want automatically performed at system start up. If you always plan to use the 8Ø column display with DOS 3.3 or BASIC, then you can easily modify your greeting program to do this for you. As an example, we will change the greeting program on the DOS 3.3 SYSTEM MASTER disk to perform this task.

1. If you have not already done so, make a copy of the DOS 3.3 SYSTEM MASTER as the original copy that comes with your disk system is permanently write-protected.

2. Press the <CAPS LOCK> key for upper case only operation.

3. Insert the DOS 3.3 SYSTEM MASTER disk in the disk drive and type LOAD HELLO.

4. Type this line into the program:

```
1 PRINT CHR$(4)"PR#3"
```

5. Save the revised program by typing these commands:

```
UNLOCK HELLO
SAVE HELLO
LOCK HELLO
```

You can now restart the system with the disk containing the new HELLO program. The 8Ø Column Video Display will now be activated automatically at system start up. This change can be added to any greeting program on any DOS 3.3 disk.

Use with Apple Pascal and CP/M

The Apple Pascal and CP/M operating systems will automatically find and activate the 8Ø Column Video Display for you. These operating systems were designed for use with an 8Ø column display so everything you need to know should be contained in the documentation for your system.

You now know how to activate and deactivate your 8Ø Column Video Display as well as switching from 4Ø to 8Ø column displays. Go on to the next section to learn about the escape editing features available with the 8Ø Column Video Display.

ESCape Editing Features

The addition of the 80 Column Video Display to your Apple][e allows the use of many valuable ESCape editing functions. These functions include an uppercase-restrict mode for easy entry of upper and lower case characters in BASIC strings, cursor movement in all four directions, switching of 40 and 80 column screens and deactivation of the 80 Column Video Display. All of these ESCape functions will be fully explained in this section.

The Uppercase-Restrict Mode

Both versions of BASIC available on the Apple][e accept only uppercase characters for program commands, but both upper and lower case characters can be entered into PRINT statements. Normally this means heavy use of the <SHIFT> or <CAPS LOCK> key when entering your BASIC program. The uppercase-restrict mode translates all lower case characters to uppercase except inside double quotation marks (which is the only time you will be typing lower case characters). This feature is available only when the 80 Column Video Display is active.

To turn on the uppercase-restrict mode simply press <ESC> and then the <R> key. Now all characters typed outside of the double quotation marks will be in uppercase but inside you can type upper and lowercase characters with the use of the <SHIFT> key.

Before <ESC> R with the <CAPS LOCK> key pressed:

```
100 PRINT "THIS IS ALL UPPERCASE"
```

After uppercase-restrict mode is turned on by <ESC> R and the <CAPS LOCK> key released:

```
100 PRINT "This is Upper and Lowercase"
```

The T, U and L were entered by using the <SHIFT> key.

The uppercase-restrict mode is available in the 40 column display mode as long as the 80 Column Video Display is active; this can be accomplished by activating it with the PR#3 command and then switching to 40 column mode by typing <ESC> 4.

In order to turn off the uppercase-restrict mode type <ESC> and then the <T> key.

Cursor Movement on the Screen

When you are entering a BASIC program, you probably make some typing mistakes. To make editing easier, ESCape mode lets you move the cursor anywhere on the screen to change a command line. These features are available when the 80 Column Video Display is active or inactive. The only difference is that when the 80 Column Video Display is active, the ESCape mode cursor contains a plus sign and when it is inactive the ESCape mode cursor doesn't change appearance.

You can move the cursor anywhere on the video screen by typing the <ESC> key and any of the following keys:

A, B, C, D, a, b, c, d

I, J, K, M, i, j, k, m

The four arrow keys

The direction of the cursor keys follows that of the diagram in Figure 4. The A, B, C and D keys need to be preceded by the <ESC> key for each movement. The <ESC> key only needs to be pressed once when using the I, J, K, M and arrow keys to move around the screen. In order to get out of ESCape mode when using these keys press the <SPACE BAR>.

Direction of the Cursor Keys

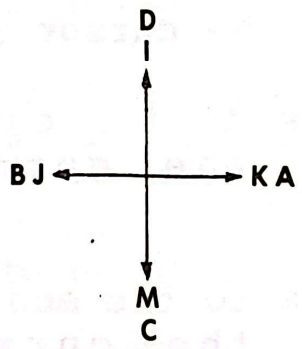

Figure 4

For more information on using the cursor direction keys refer to the Applesoft Reference Manual by Apple Computer, Inc.

Table of ESCape Features

Here is a complete list of all ESCape features available. Note that these functions can only be typed in at the keyboard and are not available under program control.

These ESCape functions need to be preceded by an <ESC> for each occurence:

<ESC> @ Clears the screen window and homes the cursor.

<ESC> A Moves the cursor right one column.

<ESC> B Moves the cursor left one column.

<ESC> C Moves the cursor down one line.

<ESC> D Moves the cursor up one line.

<ESC> E Clears to the end of the line from the current cursor position.

<ESC> F Clears to the end of the screen from the current cursor position.

These ESCape functions are only available while the 8Ø Column Video Display is active:

<ESC> R Turns on the uppercase-restrict mode.

<ESC> T	Turns off the uppercase-restrict mode.
<ESC> 4	Switches the display mode from 8Ø to 4Ø columns. The 8Ø column ESCape functions are still active.
<ESC> 8	Switches the display mode from 4Ø to 8Ø columns.
<ESC> <CTRL-Q>	Deactivates the 8Ø Column Video Display.

These ESCape functions need to be preceded by only one <ESC>. In order to exit the ESCape mode press the <SPACE BAR>.

<ESC> I <ESC> ↑	Moves the cursor up one line and turns on ESCape mode.
<ESC> J <ESC> ←	Moves the cursor left one column and turns on ESCape mode.
<ESC> K <ESC> →	Moves the cursor right one column and turns on ESCape mode.
<ESC> M <ESC> ↓	Moves the cursor down one line and turns on ESCape mode.

These ESCape features are available only for BASIC users and not for Apple Pascal and CP/M as they have their own standards for screen editing.

This completes the section on ESCape editing features. Go on to the next section to learn about the display features and control code commands.

Display Features and Control Code Commands

The 8Ø Column Video Display adds some display features to your Apple][e computer. There are also some differences to the way the 8Ø Column Video Display reacts to certain BASIC commands such as FLASH and HTAB. There is also a complete set of control codes for various screen display functions. This section will explain these features and control codes.

Display Features

INVERSE: This command changes the display of characters from white on black to black on white. Normally this works only for uppercase characters and symbols but with the 8Ø column display it works for all characters, both upper and lowercase.

FLASH: This command makes all subsequent characters blink between normal and inverse. With the 8Ø Column Video Display active this command is not available.

NORMAL: This command turns off the INVERSE or FLASH command and returns the display of characters to their normal state. The 8Ø Column Video Display has no effect upon this command.

HOME: This command clears the screen and returns the cursor to the upper left corner of the video screen. If the 8Ø Column Video Display is active and the INVERSE command is in effect, the screen will clear to white and print black characters.

VTAB: This command allows you to place the cursor on any line from 1 to 24. The VTAB command works the same regardless of whether the 80 Column Video Display is active or inactive.

HTAB: This command allows you to place the cursor on a column from 1 to 40. If you use this command with a value greater than 40, the column position will wrap around down to the next line. In order to place the cursor on a column from 1 to 80 it is better to use the POKE 36,n command (n is a column position from 1 to 80). Here is an example of how to use VTAB and POKE 36,n for cursor positioning:

```
100 PR#3
110 NORMAL
120 VTAB 12
130 POKE 36,33
140 PRINT "IN THE MIDDLE"
RUN
```

This causes the message "IN THE MIDDLE" to be placed in the middle of the video screen starting at row 12 and column 33.

Comma Tabbing in PRINT Statements

In BASIC print statements the comma is used to force whatever is being printed to the next tab position. This will work fine as long as the 80 Column Video Display is inactive or displaying 40 columns; however, you cannot use this method of tabbing when you are in 80 column mode. Your program will not run properly if you do.

Control Code Commands

With the 80 Column Video Display active there are many control code functions available to aid you in your display of text on the video screen. These control codes can easily be activated by printing the proper code with the CHR$ command in Applesoft BASIC. Some of these commands can also be activated by pressing a CONTROL code from the keyboard. Here is a complete listing of these control codes and the functions they perform:

Code	Function Performed
7 ($07)	Bell command. This produces a 1000 Hz tone for 0.1 second.
8 ($08)	Backspace command. This moves the cursor left by one column. If the left edge of the window is reached, the cursor moves to the right end of the line above.
10 ($0A)	Linefeed command. This moves the cursor down one line and scrolls the screen if the bottom has been reached.
11 ($0B)	Clear to end of screen command. This clears the screen from the current cursor position to the end of the screen.
12 ($0C)	Clear screen command. Clears the screen window and moves the cursor to the upper left corner.

13 ($ØD) Carriage return command. This moves the cursor to the left end of the next line down and scrolls the screen if the bottom has been reached.

Control codes 14, 15, 17, 18 and 21 cannot be typed at the keyboard, they can only be used from within a program.

14 ($ØE) Normal command. This sets the display of characters to white on black.

15 ($ØF) Inverse command. This sets the display of characters to black on white.

17 ($11) 4Ø column command. This sets the display mode to 4Ø columns.

18 ($12) 8Ø column command. This sets the display mode to 8Ø columns.

21 ($15) Deactivation command. This deactivates the 8Ø Column Video Display, clears the screen and returns the cursor to the upper left corner of the video screen.

22 ($16) Scroll down command. This scrolls the screen down one line leaving the cursor in the same position.

23 ($17) Scroll up command. This scrolls the screen up one line leaving the cursor in the same position.

25 ($19) Home command. This moves the cursor to the upper left corner of the screen window without clearing the screen.

26 ($1A) Clear line command. This clears the line that the cursor is on.

28 ($1C) Forward space command. This moves the cursor one column to the right. If the right edge of the window is reached, the cursor moves to the left end of the next line down.

29 ($1D) Clear to end of line command. This clears the line from the current cursor position to the end of the line.

30 ($1E) Go to X-Y command. This command takes the next two characters as X and Y values, minus 32, to position the cursor. This command is not available to BASIC, but is used with the gotoXY function in Apple Pascal.

Control Code Commands in Programs

In order to perform these functions from within a program, simply print the ASCII decimal code that corresponds to each command. In Applesoft BASIC this could be accomplished using the CHR$ command in a PRINT statement. Note that the 80 Column Video Display must be activated prior to sending these control codes.

Try out the following BASIC program to get an idea of how this works:

```
100 PR#3
110 PRINT CHR$(17)
120 PRINT "HELLO 40 COLUMN DISPLAY"
130 PRINT CHR$(15)
140 PRINT "HELLO IN INVERSE"
150 PRINT CHR$(18)
160 PRINT CHR$(14)
170 PRINT "HELLO 80 COLUMN DISPLAY"
180 PRINT CHR$(15)
190 PRINT "HELLO IN 80 COLUMN INVERSE"
200 PRINT CHR$(14)
RUN
```

This program clears the display and switches to 40 column mode. It then prints a message in NORMAL and INVERSE characters. The 80 column mode is then selected and another NORMAL and INVERSE message is printed.

This completes the section on display features and control code commands. Go on to the next section to learn about how to use the auxiliary memory on the 80 Column Video Display/64K Version.

Using the Auxiliary Memory

The 80 Column Video Display is available in two versions. The 1K Version simply contains enough extra memory to handle the additional 40 columns of display data. The 64K Version has the 1K for the 80 column display and 63K of additional auxiliary memory. This section will describe how to use this auxiliary memory.

If your use of the 80 Column Video Display/64K Version is limited to the 80 column display or the use of commercial software packages, you don't have to read this section to utilize the auxiliary memory. If these programs use the auxiliary memory they will do so automatically or will let you select an option in the setup indicating that auxiliary memory is present. To find out how to use these programs with the auxiliary memory, refer to their instruction manuals replacing any references to the Extended 80 Column Text Card with 80 Column Video Display/64K Version.

The information contained in the rest of this section is highly technical and is intended for the advanced Apple][e user. Some address values will be given in hexadecimal and some technical jargon is used. Proceed at your own discretion.

How the 80 Column Video Display Works

Most of the 80 column display capability of the Apple][e is already built in to your computer. This includes the 80 column display circuitry, 40/80 column soft switch and the driver firmware. The 80 Column Video Display simply provides the extra memory needed for the additional 40 columns. The 80 Column Video Display/1K Version provides only the additional memory needed for the extra 40 columns. The Apple][e is designed to handle 64K sections of bank switchable main memory installed in the auxiliary slot. In order to use this auxiliary memory you must have the 80 Column Video Display/64K Version.

The 40 column display is produced by fetching successive bytes from the TEXT page located at $0400 to $07FF. This is enough memory for the 960 bytes of display data on the 24 X 40 video screen. These bytes are fetched on every other clock cycle. The 80 column display uses the remaining clock cycles to fetch the additional data from auxiliary memory. This means that half of the display data is stored in main memory and the other half is stored in auxiliary memory. The display circuitry fetches a byte from main and auxiliary memory simultaneously and displays them as two adjacent characters on the video screen. The odd columns on the display are stored in main memory and the even columns are stored in auxiliary memory.

80 Column Display Soft Switches

There are various soft switches that can be used to directly control the 80 Column Video Display's various display modes. Some of these addresses are read/write and some are read only or write only. In any case, the value written doesn't matter, the operation on the address turns the switch on or off. When reading the state of a particular switch, the 7th bit or high order bit returns the current status. A value of 1 indicates ON and a value of 0 indicates OFF. These soft switches are explained in detail below:

TEXT: This soft switch controls whether text or graphics will be displayed on the video screen. A read or write to address $C051 (-16303) will turn text ON. A read or write to address $C050 (-16304) will turn text OFF and the graphics display on. A read from address $C01A (-16358) will return the state of the TEXT switch.

MIXED: This soft switch controls whether text with graphics or only text will be displayed, if the TEXT switch is off. A read or write to address $C053 (-16301) will turn mixed text and graphics ON. A read or write to address $C052 (-16302) will turn mixed text and graphics OFF and enable a full graphics display. A read from address $C01B (-16357) will return the state of the MIXED switch.

PAGE2: This soft switch controls whether display Page 1 or 2 is used. A read or write to address $C055 (-16299) will turn Page 2 ON. A read or write to address $C054 (-16300) will turn Page 2 OFF and select Page 1. A read from address $C01C (-16356) will return the state of the PAGE2 switch.

HIRES: This soft switch controls whether high resolution or low resolution graphics will be displayed, if the TEXT switch is set off. A read or write to address $C057 (-16297) will turn high resolution graphics ON. A read or write to address $C056 (-16298) will turn high resolution graphics OFF and enable low resolution graphics. A read from address $C01D (-16355) will return the state of the HIRES switch.

80COL: This soft switch controls whether 40 or 80 columns are displayed. A write to address $C00D (-16371) will turn the 80 column display ON. A write to address $C00C (-16372) will turn the 80 column display OFF and enable 40 columns. A read from address $C01F (-16353) will return the state of the 80COL switch.

80STORE: This soft switch controls which display page will be accessed. A write to address $C001 (-16383) turns this switch ON, enabling access to the auxiliary display page. A write to address $C000 (-16384) turns this switch OFF, enabling access to the main memory display page. A read from address $C018 (-16360) will return the state of the 80STORE switch.

Accessing the 80 Column Display Directly

The 80 column display needs additional memory for the extra 40 columns it provides. Text Page 1 in main memory holds the odd columns of data and text Page 1X in auxiliary memory holds the even columns. Page 1X is at the same address as Page 1 with the 80STORE soft switch controlling which page you want.

To store data directly on Page 1X on the 80 Column Video Display, these steps could be taken:

Turn on the 80STORE switch.
Turn on the PAGE2 switch.
Write data to the text page.

Here is a short BASIC program that will display "APPLE" in the upper left hand corner of the 80 column video screen.

```
100 PR#3
110 PRINT:PRINT
120 POKE -16383,0
130 POKE -16299,0
140 POKE 1024,ASC("A")
150 POKE 1025,ASC("P")
160 POKE 1026,ASC("E")
170 POKE -16300,0
180 POKE 1024,ASC("P")
190 POKE 1025,ASC("L")
```

Notice that first "A P E" was printed in the even columns 0, 2 and 4. Then the page was switched and " P L " was printed in the odd columns 1 and 3.

How the Auxiliary Memory Works

The auxiliary memory is 64K bytes of memory on the 8Ø Column Video Display/64K Version that can be bank switched with main memory under program control. There are soft switches that control reading and writing of main and auxiliary memory, and what section of auxiliary memory to switch in. There are also firmware routines built into the Apple][e monitor to move data to and from auxiliary memory and to transfer program control to and from auxiliary memory.

Auxiliary Memory Soft Switches

RAMRD: This soft switch controls whether main or auxiliary memory will be read. A write to address $CØØ3 (-16381) will turn this switch ON, enabling reading of the 48K section of auxiliary memory. A write to address $CØØ2 (-16382) will turn this switch OFF, enabling a read to the 48K section of main memory. A read from address $CØ13 (-16365) will indicate the state of the RAMRD switch.

RAMWRT: This soft switch controls whether main or auxiliary memory will be written to. A write to address $CØØ5 (-16379) will turn this switch ON, write enabling the 48K section of auxiliary memory. A write to address $CØØ4 (-16380) will turn this switch OFF, write enabling the 48K section of main memory. A read from address $CØ14 (-16354) will return the state of the RAMWRT switch.

ALTZP: This soft switch controls whether the main or auxiliary zero page, stack and bank-switched memory will be accessed. A write to address $C009 (-16373) will turn this switch ON, enabling the auxiliary zero page, stack and bank-switched memory. A write to address $C008 (-16374) will turn this switch OFF, enabling the main zero page, stack and bank-switched memory. A read from address $C016 (-16352) will return the state of the ALTZP switch.

80STORE: This soft switch is used to access the auxiliary display page regardless of the state of the RAMRD and RAMWRT switches. A write to address $C001 (-16383) turns this switch ON, enabling access to the auxiliary display page. A write to address $C000 (-16384) turns this switch OFF. A read from address $C018 (-16360) will return the state of the 80STORE switch.

PAGE2: This soft switch controls whether the main or auxiliary display page is accessed. This switch is only effective if the 80STORE switch is on. A read or write to address $C055 (-16299) turns this switch ON, enabling access to the auxiliary memory display page. A read or write to address $C054 (-16300) turns this switch OFF, enabling access to the main memory display page. A read from address $C01C (-16356) will return the state of the PAGE2 switch.

HIRES: This soft switch controls whether the display page enabled by PAGE2 is the text display page or the high resolution graphics display page. This switch is only effective if the 8ØSTORE switch is on. A read or write to address $CØ57 (-16297) turns this switch ON, enabling access to the main and auxiliary high resolution display pages. A read or write to address $CØ56 (-16298) turns this switch OFF, enabling access to the main and auxiliary text display pages. A read from address $CØ1D (-16355) will return the state of the HIRES switch.

By using RAMRD and RAMWRT you can select any combination of reading and writing main or auxiliary memory. These switches are only effective for the address range from $Ø2ØØ to $BFFF. The ALTZP switch controls the address range from $ØØØØ to $Ø1FF and $DØØØ to $FFFF. Note also that the 8ØSTORE, PAGE2 and HIRES switches take priority over the RAMRD and RAMWRT switches in the display page areas.

Using the Auxiliary Memory Subroutines

In order to make your task of using the auxiliary memory easier, the Apple][e contains built-in support subroutines. These routines will help you move blocks of data to and from auxiliary memory and to transfer program control to and from auxiliary memory. You can use these routines the same way you use other routines in the Apple][e monitor, by making subroutine calls to their starting address. These subroutines and their parameters will be fully explained. Note that all addresses are low byte-high byte format.

AUXMOVE: This routine is located at address $C311. It is used to move blocks of data to and from auxiliary memory. Here is how to use it: Set the carry flag to indicate the direction of the transfer; 1 = move from main to auxiliary memory, Ø = move from auxiliary to main memory. Put the source starting address in A1L ($3C) and A1H ($3D), the source ending address in A2L ($3E) and A2H ($3F) and the destination starting address in A4L (42) and A4H ($43). Then call the subroutine AUXMOVE. The block of data will be moved and the X and Y registers will be undisturbed.

Do not use this routine to copy data to page zero, the stack or the bank-switched memory. AUXMOVE uses ALTZP while it is copying, so it can't move data to any address switched by ALTZP.

XFER: This routine is located at address $C314. It is used to transfer program control to and from auxiliary memory. Here is how to use it: The carry bit is used to indicate the direction of the transfer; 1 = transfer from main to auxiliary memory, Ø = transfer from auxiliary to main memory. The overflow flag is used to indicate which zero page and stack to use; 1 = use the zero page and stack in auxiliary memory, Ø = use the zero page and stack in main memory. Put the program starting address in $3ED and $3EE and jump to XFER ($C314). XFER saves the accumulator and transfer address on the stack and transfers control to the new program.

Double High Resolution Graphics

The normal density of the high resolution graphics screen on the Apple][e is 28Ø dots horizontally. In order to achieve the density necessary for an 8Ø column display, the 7MHz dot clock is doubled to 14MHz, allowing a 56Ø dot horizontal density. Whenever the Apple][e enables a graphic display a special circuit forces the horizontal dot density back to 28Ø. This is done because the graphic plotting routines don't support the 56Ø dot density.

For those who would like to utilize the double high resolution graphics display, there is a way to disable the circuit in the Apple][e that forces normal graphic timing with 80 column text. There are two steps to disable this circuit:

1. Install a jumper to connect the two Molex pins on the 80 Column Video Display/64K Version. This jumper is labeled J1 on the circuit board.

2. Turn on the Annunciator 3 soft switch along with the switches that select the 80 column display and high resolution graphics.

There are certain requirements to be able to take advantage of this modification. You must have a Rev B or later Apple][e, identified by a B as the last letter of the part number on the back part of the main logic board. You must also have the 64K Version of the 80 Column Video Display.

This modification will not work on a Rev A Apple][e as the installation of the jumper will hang up the computer.

When this modification is performed the graphics display works similarly to the text display. One half of the graphics display page is in main memory and the other half is in auxiliary memory. The display circuitry fetches a byte from auxiliary and main memory and displays them as two adjacent pairs of 7 bit wide groups of high resolution dots. The auxiliary memory byte is displayed first, then the main memory byte. The main memory graphics display page is called Page 1 and is located from $2000 to $3FFF in main memory. The auxiliary memory graphics display page is called Page 1X and is located from $2000 to $3FFF in auxiliary memory.

Current Apple][programs do not support this 560 dot display. Until these programs become available, you will have to write your own plotting routines to take advantage of the double high resolution graphics.

For more details on auxiliary memory in the Apple][e, refer to the Apple][e Reference Manual by Apple Computer, Inc.

This completes the section on using the auxiliary memory. Go on to the next section to learn how to upgrade the 1K Version of your 80 Column Video Display to the 64K Version.

Upgrading the 1K Version to 64K

The 80 Column Video Display comes in two versions: A 1K Version that provides only the 80 column display and a 64K Version that provides additional memory as well as the 80 column display. The 1K Version is upgradable to the 64K Version simply by removing three integrated circuits and adding eight more. This section will describe how to perform this upgrade.

In order to perform this upgrade, you must have these things on hand:

One 80 Column Video Display/1K Version
One 64K Upgrade Kit
One I.C. puller or small flat bladed screwdriver

Follow these steps to perform the upgrade:

1. Place the 80 Column Video Display circuit board in front of you. There should be 5 I.C.s on the circuit board in sockets U1, U4, U5, U8 and U9.

2. Touch something grounded near you such as the power supply cover of your Apple][e to discharge yourself of any static electricity.

3. Using the I.C. puller or screwdriver, remove the 74LS75 in socket U1, the SY2159A-2 in socket U4 and the 74LS374 in socket U5. See Figure 5 for details.

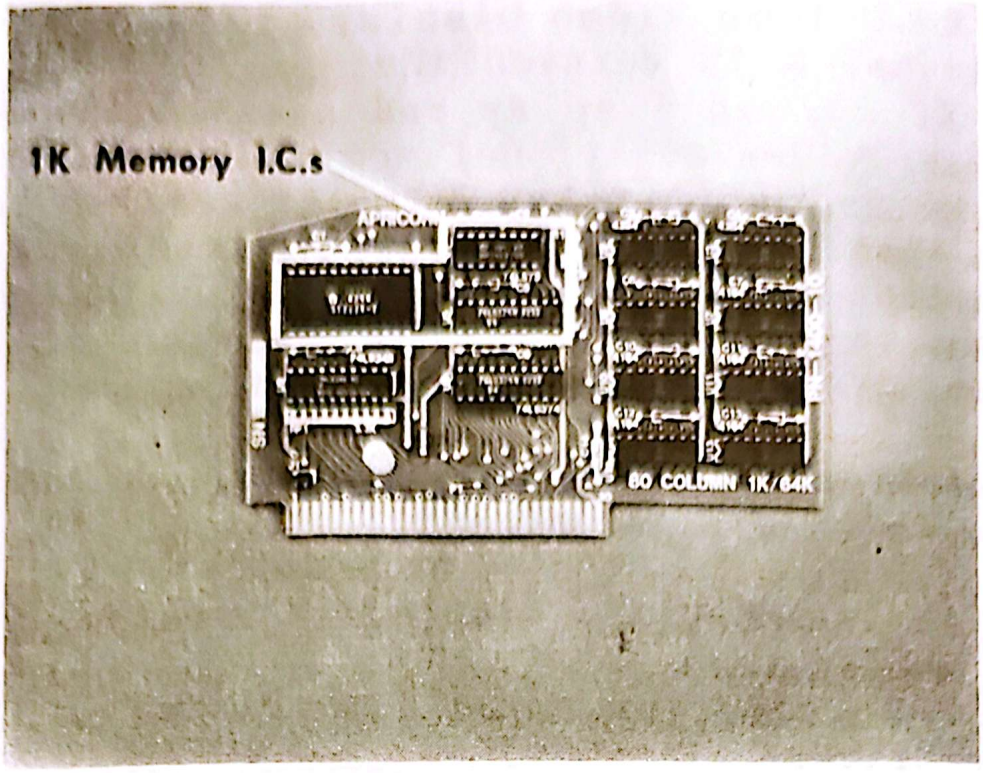

Figure 5

Using the I.C.s in the Upgrade Kit, plug each of the eight RAM chips into sockets U2, U3, U6, U7, U1Ø, U11, U12 and U13. Make sure that the notch on each chip is facing towards the left, or KEYBOARD END of the board. See Figure 6 for details.

The 8Ø Column Video Display is now upgraded to the 64K Version. You can take advantage of the capabilities offered by the 64K Version such as the auxiliary memory and double high resolution graphics. Refer to the section on using the auxiliary memory for more information.

The 80 Column Video Display/64K Version

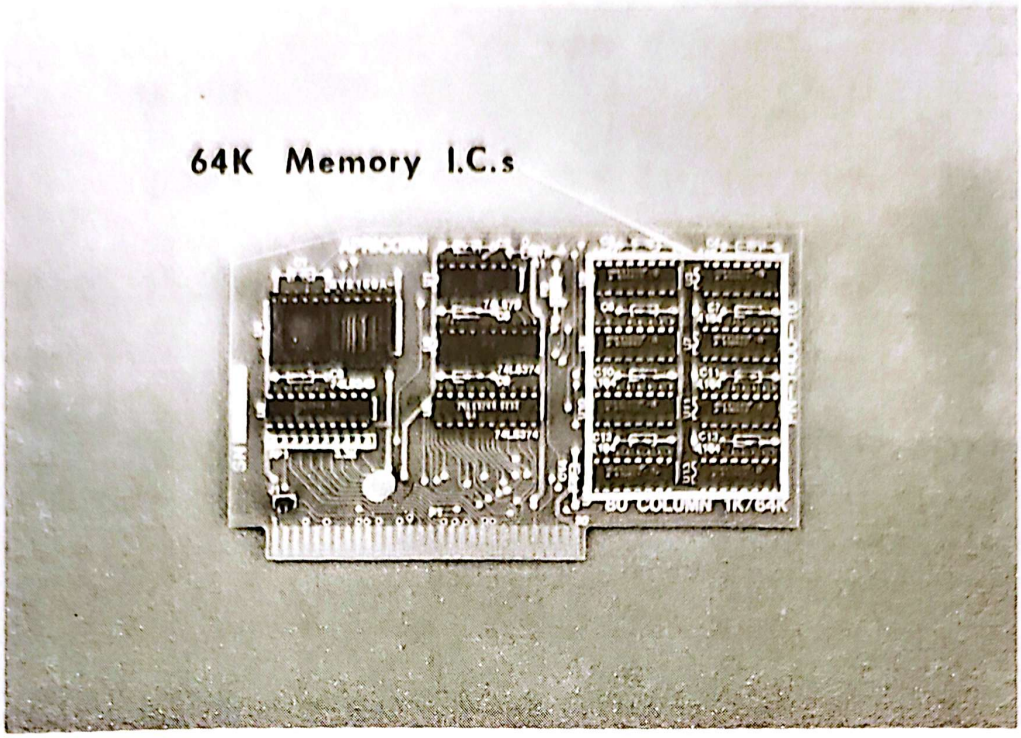

Figure 6

If you have trouble performing this upgrade or if you need assistance, contact the dealer from whom you purchased the product for assistance. If they can't solve your problem, call or write to:

Apricorn Technical Assistance
7050 Convoy Court
San Diego, CA. 92111
(619) 569-9483

Parts Lists

Here are complete parts lists for each version of the 80 Column Video Display and the 64K Upgrade Kit.

Parts List for the 1K Version

Reference	Description	Quantity
74LS75	Quad Bistable Latch	1
74LS245	Octal Transceiver	1
74LS374	Octal D Flip-Flop	2
SY2159A-2	1K X 8 Static RAM	1
R1,R2	47 Ohm 1/4W,5% Res.	2
RP1	3.3K 10 Pos. SIP	1
C1-C14	0.1mF/50V Axial Cap.	14
J1	2 Position Jumper	1
PN-1400-10	Circuit Board	1

Parts List for the 64K Version

Reference	Description	Quantity
74LS245	Octal Transceiver	1
74LS374	Octal D Flip-Flop	1
4164	64K X 1 DRAM	8
R1,R2	47 Ohm 1/4W,5% Res.	2
RP1	3.3K 10 Pos. SIP	1
C1-C14	0.1mF/50V Axial Cap.	14
J1	2 Position Jumper	1
PN-1400-10	Circuit Board	1

Parts List for the 64K Upgrade Kit

Reference	Description	Quantity
4164	64K X 1, 150 ns DRAM	8

Warranty

Apricorn warrants the 80 Column Video Display for the Apple][e computer against defects in materials and workmanship for as long as the original purchaser owns the product.

The product will be repaired or replaced at the option of Apricorn. The warranty does not apply if the product has been damaged by accident, abuse, misuse or misapplication or has been modified in any way.

In order to obtain warranty service return the product to the Apricorn Service Department. Attach to the product your name, address, telephone number, description of the problem and a bill of sale as proof of original retail purchase.

Ship the product prepaid and insured to:

Apricorn Service Department
7050 Convoy Court
San Diego, CA 92111

Apricorn shall have no liability or responsibility with respect to the merchantability or fitness of the product for a particular purpose. Apricorn is not liable or responsible for any direct, indirect, incidental or consequential damages arising out of the use of this product. This warranty does not extend to any other products used in conjunction with this product and is limited to the repair or replacement of the product.

7050 CONVOY COURT • SAN DIEGO, CALIFORNIA 92111 • (619) 569-9483